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SPECIFICATION

1. Title of the Invention

Circuit Board with Circuit-Component Mounting terminal and Manufacturing Method thereof

2. Claims

(1) A circuit board with a circuit-component mounting terminal, comprising an insurating substrate, a required circuit-wiring pattern formed on said insulating substrate, and a circuit-component interconnecting pad or bump which has one end electrically joining to said circuit-wiring pattern and the other end penetrating through and protruding outside said insulating substrate, wherein

said circuit-wiring pattern has a front surface formed with a metal layer excellent in corrosion resistance.

(2) A method of manufacturing a circuit board with a circuit-component mounting terminal, comprising the steps of:

forming a required circuit-wiring pattern and a metal mask on one surface and the other surface of an insulating substrate, respectively;

processing said metal mask to form therein a hole at a position corresponding to that of said circuit-wiring pattern and a separatory grooved-opening having a shape in conformity with the outline of said circuit board;

then covering the front surface of said circuit-wiring pattern with a metal layer excellent in corrosion resistance;

then emitting an excimer laser from the side of said metal mask to form a conducting hole extending from said hole to said circuit-wiring pattern and a separating groove extending from said separatory grooved-opening;

then etching and removing said metal mask and a portion of said circuit-wiring pattern exposing to said conducting hole; and

finally forming to said conducting hole a circuit-component interconnecting pad or bump which has one end electrically joining to said circuit-wiring pattern and the other end protruding outside said insulating substrate.

3. Detailed Description of the Invention

[Field of Industrial Application]

The present invention relates to a circuit board with a terminal for mounting a circuit component such as an IC, and a manufacturing method thereof. More specifically, the present invention a circuit board with a circuit-component mounting terminal, comprising an insurating substrate, a required circuit-wiring pattern formed on the insulating substrate, and a high-precision, circuit-component interconnecting pad or bump which has one end electrically joining to the circuit-wiring pattern and the other end penetrating through and protruding outside the insulating substrate, and to a method of manufacturing such a circuit board.

[Prior Art and its Problem]

A technique of manufacturing this kind of circuit board with a terminal for mounting a circuit component such as an IC includes a method as shown in Fig. 3. At the first step of this method, a required circuit-wiring pattern 22 and an excimer-laser blocking metal mask 23 are formed on one surface and the other surface of a flexible or rigid insulating substrate 21, respectively, as shown in Fig. 3 (1). This metal mask 23 is processed to form therein a hole 24 at a position corresponding to that of the circuit-wiring pattern 22. A protective film 26 composed of a polyimide film or the like is attached on the side of the front surface of the circuit-wiring pattern 22 with an adhesive 25 to form a surface protection layer 27.

As shown in Fig. 3 (2), an excimer laser A is then emitted from the side of the metal mask 23 to form a conducting hole 28 reaching the circuit-wiring pattern 22. After the metal mask 23 no longer required is then removed through etching or any other suitable method as shown in Fig. 3 (3), a pad 29 or bump for interconnecting a circuit component such as an IC, which has a configuration such that one of the ends of the pad or bump electrically joins to the circuit-wiring pattern 22 and the other end thereof protrudes outside the insulating substrate 21, is formed to the conducting hole 28 through a filling method such as soldering. In the step of removing the metal mask 23, the back surface of the circuit-wiring pattern 22 is also exposed to and damaged by an etchant to form a depressed portion 22A therein or to form a through hole therein in the extreme case. The level of the damage is affected by variation in etching resistance of a processed layer which is typically applied on the back surface of a copper foil forming the circuit-wiring pattern 22 to provide enhanced adhesiveness between the copper foil and a polyimide film used as the insulating substrate 21, contamination of the surface of the metal mask 23, variation in the thickness of the metal mask 23, variation in a renewed level of etchant inside the conducting hole 28 and other factors. Such a variation in the damage level of a portion of the circuit-wiring pattern 22 located correspondingly to the conducting hole 28 causes variation in the size or height of the interconnecting pad or bump 29, which undesirably leads to improper interconnection when mounting a circuit component such as an IC.

[Object and Construction of the Invention]

It is an object of the present invention to provide a circuit board with a high-precision circuit-component mounting terminal, capable of reliably eliminating a situation causing a damage in a circuit-wiring pattern during an etching process for removing a metal mask and desirably preventing any improper interconnection when mounting a circuit component such as an IC, and to provide a method of manufacturing such a circuit board.

In order to achieve the above object, according to the present invention, there is provided a circuit board with a circuit-component mounting terminal, comprising an

insurating substrate, a required circuit-wiring pattern formed on the insulating substrate, and a circuit-component interconnecting pad or bump which has one end electrically joining to the circuit-wiring pattern and the other end penetrating through and protruding outside the insulating substrate. In this circuit board, the circuit-wiring pattern has a front surface formed with a metal layer excellent in corrosion resistance.

Further, according to the present invention, there is provided a method of manufacturing a circuit board with a circuit-component mounting terminal, comprising the steps of: forming a required circuit-wiring pattern and a metal mask on one surface and the other surface of an insulating substrate, respectively; processing the metal mask to form therein a hole at a position corresponding to that of the circuit-wiring pattern and a separatory grooved-opening having a shape in conformity with the outline of the circuit board; then covering the front surface of the circuit-wiring pattern with a metal layer excellent in corrosion resistance; then emitting an excimer laser from the side of the metal mask to form a conducting hole extending from the hole to the circuit-wiring pattern and a separating groove extending from the separatory grooved-opening; then etching and removing the metal mask and a portion of the circuit-wiring pattern exposing to the conducting hole; and finally forming to the conducting hole a circuit-component interconnecting pad or bump which has one end electrically joining to the circuit-wiring pattern and the other end protruding outside the insulating substrate.

[Embodiment]

The present invention will now be described in detail in conjunction with an illustrated embodiment. Fig. 1 is an enlarged fragmentary sectional bock diagram conceptually showing a circuit board with a circuit-component mounting terminal according to one embodiment of the present invention. In Fig. 1, a circuit-wiring pattern 2 covered with a metal layer 6 having a high corrosion resistance is formed at a given position of one surface of a flexible or rigid insulating substrate 1. A pad or bump 11 for interconnecting a circuit component such as an IC is formed to a conducting hole 10 extending from the upper surface of the insulating substrate 1 to the metal layer 6 through the insulating substrate 1 and the circuit-wiring pattern 2. The pad or bump 11

has one end electrically joining to the circuit-wiring pattern 2 and the other end protruding outside the insulating substrate 1. Further, a protective film 8 such as a polyimide film is attached on the side of the front surface of the circuit-wiring pattern 2 with an adhesive 7 to form a surface protection layer 9. The surface protection layer 9 is not limited to the above film member but may be formed by printingly applying a varnish-like polyimide resin, an insulative cover coat ink or the like.

Figs. 2 (1) to 2 (4) are manufacturing process diagrams for the above circuit board. As shown in Fig. 2 (1), a material such as an adhesive-layer-contained or non-adhesive type of flexible or rigid double-sides copper-clad laminate is first prepared as an insulating substrate 1. Then, the insulating substrate 1 is subjected to photoetching so as to form a given circuit-wiring pattern 2 and a metal mask 3 on one surface and the other surface of the insulating substrate 1, respectively. As illustrated, the metal mask 3 is provided with a hole 4 formed at a position corresponding to that of the circuit-wiring pattern 2 and a separatory grooved-opening 5 formed in conformity with the outline of an intended product. Then, as shown in Fig. 2 (2), a metal layer 6 having a high corrosion resistance is formed on the front surface of the circuit-wiring pattern 2 through an electroplating method or the like, and a protective film 8 such as a polyimide film is attached on the side of the front surface of the metal layer 6 with an adhesive 7 to form a surface protection layer 9.

Subsequently, as shown in Fig. 2 (3), an excimer laser A is emitted from the side of the metal mask 3 to form a separating groove 5A and a conducting hole 10 for forming thereto an after-mentioned terminal for mounting a circuit component such as an IC, through an laser abrasion method. Then, as shown in Fig. 2 (4), the layer of the metal mask 3 is etched and removed. During this step, a portion of the circuit-wiring pattern 2 at the bottom region of the conducting hole 10 is also etched and removed. Then, a filling method such as soldering can be applied to the conducting hole 10 so as to form thereto a pad or bump 11 for interconnecting a circuit component such as an IC, which has one end electrically joining to the circuit-wiring pattern 2 and the other end protruding outside the insulating substrate 1.

[Effect of the Invention]

A circuit board with a circuit-component mounting terminal and a manufacturing method thereof according to the present invention make it possible to cover the front surface of the circuit-wiring pattern with the metal layer having a high corrosion resistance. Thus, even if a part of the circuit-wiring pattern is penetratingly etched during the etching process of removing the metal mask, the metal layer can maintain the conduction at the bottom region of the conducting hole without deterioration. Further, an increasing level of the depth of the conducting hole through the etching process can be stably kept constant in proportion to the conductor thickness of the circuit-wiring pattern.

Thus, the variation in the size and/or height of the interconnecting pad or bump causing improper interconnection during the interconnection with a circuit component such as an IC can be desirably eliminated to stably provide a circuit board with a circuit-component mounting terminal having a significantly high reliability of interconnection.

4. Brief Description of the Drawings

Fig. 1 is a conceptual enlarged fragmentary sectional bock diagram of a circuit board with a circuit-component mounting terminal, according to one embodiment of the present invention;

Fig. 2 is an exemplary manufacturing process diagram for the circuit board; and

Fig. 3 is a manufacturing process diagram for a circuit board with a circuit-component mounting terminal, according to a conventional method.

1: insulating substrate

2: circuit-wiring pattern

3: metal mask

4: hole

5A: separating groove

6: metal layer

7: adhesive

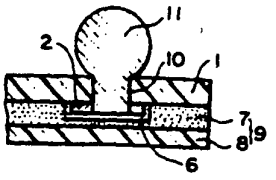
8: protective film

9: surface protection layer

10: conducting hole

11: interconnecting pad or bump

第1図



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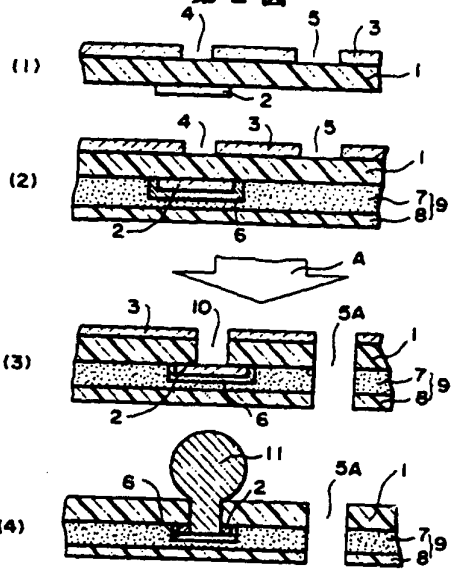

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